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Science Advisory Report 2014/031

Maritimes Region

## ASSESSMENT OF SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP FISHING AREA (SFA) 29 WEST OF LONGITUDE 65°30'W

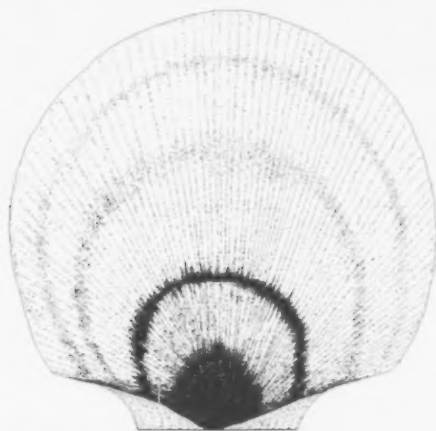


Figure 1. Location of the portion of SFA 29 west of longitude 65°30'W. Refer to full detail map in Appendix 1 for place names.

### Context:

Scallop Fishing Area (SFA) 29 encompasses a very large inshore area inside the 12-mile territorial sea, from the south of Yarmouth (latitude 43°40'N) to Cape North in Cape Breton. This report refers to only that portion of SFA 29 west of longitude 65°30'W continuing north to Scallop Production Area (SPA) 3 at latitude 43°40'N (Figure 1), hereafter referred to as SFA 29 West.

Prior to 1986, the Full Bay Scallop Fleet fished in this area. Following the 1986 inshore/offshore scallop fishing agreement, fishing by the Full Bay Fleet was restricted to north of latitude 43°40'N. A limited fishery by the Full Bay Fleet was granted from 1996–98. Access was again granted to this fleet in 2001 with a full at-sea monitoring program and with a condition of a post-season industry-funded survey. SFA 29 West is within Lobster Fishing Area (LFA) 34 and, as a result, scallop fishers consulted with lobster fishers in the area to deal with potential conflicts. Lobster and bycatch of other species continue to be monitored in this fishery. In 2002, Fisheries and Oceans Canada (DFO) approved access to this area by the Full Bay Fleet and inshore East of Baccaro licence holders who are eligible to fish in SFA 29 West. SFA 29 inshore scallop licenses were historically restricted to East of Baccaro (east of longitude 65°30'W). A joint project agreement was signed with the fishing fleets, Natural Resources Canada, and DFO, with all parties providing funds to conduct multi-beam acoustic mapping of the seafloor and other scientific work. Using the multibeam data and associated derived layers a scallop habitat suitability map was developed and covers SFA 29 West subareas A–D. This map was used to develop the framework assessment methodology for SFA 29 West accepted in February 2014.

This Science Advisory Report is from the March 13, 2014, Assessment of SFA 29 West of 65°30' Scallop. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

## SUMMARY

- This scallop fishery has taken place in the portion of Scallop Fishing Area (SFA) 29 west of longitude 65°30' W since 2001 and is currently conducted by two fleets: the Full Bay Fleet and a number of inshore East of Baccaro licence holders.
- As of 2010, the Total Allowable Catch (TAC) and landings are reported as totals by subarea for both fleets combined. In 2013, a total of 154.4 t was landed against the TAC of 170 t. There was an additional Food, Social and Ceremonial catch of 4.9 t.
- In 2013, commercial densities observed from the survey were similar across habitat suitability categories within subareas A–D and either declines or no change were observed. For recruit densities observed from the survey, either declines or no change were observed for all habitat suitability categories in subareas A–D.
- From the survey, an increase in pre-recruits (20–60 mm) was observed in subareas A–D; however, the highest values are mainly concentrated in subareas C and D. These pre-recruit numbers are the highest observed in the time series and, based on growth estimates, are not expected to recruit to the fishery until 2016.
- A new framework assessment methodology was accepted in February 2014 that uses a habitat-based population model for subareas A–D. The model is based on a scallop habitat map. This map does not cover subarea E.
- Current densities (2 to 2.3 t/km<sup>2</sup> in the High habitat category, 1.5 to 1.8 t/km<sup>2</sup> in the Medium habitat category) appear to represent an approximate equilibrium level with respect to recent exploitation and recruitment rates. In the absence of increases in the rate of recruitment, continued fishing at the recent levels in the Medium and High suitability areas will likely result in densities remaining in the ranges that they have been since 2006.
- Assuming the same catch in 2014 as in 2013, and that the same fishing pattern with respect to habitat suitability areas occurs in 2014, current levels of exploitation will probably result in little change in biomass in 2014. However, densities in the High and Medium habitat categories are currently at or near their lowest values in the time series.
- In 2013, it was estimated that 15,385 lobsters were caught during the SFA 29 West scallop fishery; 2,286 were dead or injured. The estimated number of lobster caught represents < 0.1% of the lobsters caught in the 2012/2013 Lobster Fishing Area (LFA) 34 lobster fishery and 0.2% of the lobsters caught in the area of LFA 34 corresponding to SFA 29 West.

## BACKGROUND

As part of the Regional Science Advisory Process, a meeting was held on March 13, 2014, at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia to review the 2013 scallop fishery and assess the status of the scallop stock in Scallop Fishing Area (SFA) 29 West in support of the management of the 2014 fishery. Specifically, the meeting was called to provide science advice for the SFA 29 West scallop fishery by subarea based on the state-space habitat-based population model accepted at the framework meeting in February 2014. An assessment of the lobster bycatch was also provided.

## ASSESSMENT

## Fishery

This scallop fishery has taken place in the portion of SFA 29 west of longitude 65°30'W since 2001. The Full Bay (FB) scallop fleet was the sole participant in 2001. Starting in 2002, the total allowable catch (TAC) was shared between the FB fleet and a number of inshore East of Baccaro (EoB) licence holders who are eligible to fish in SFA 29 West. As of 2010, the TAC and landings are reported as totals by subarea for both fleets combined. In 2013, a total of 154.4 t was landed against the TAC of 170 t. There was an additional Food, Social and Ceremonial (FSC) catch of 4.9 t (Table 1; Figure 2).

Table 1. Scallop landings (meats, t) and TACs for subareas of SFA 29 West in 2013. Table includes FSC catch, which is added to the total landings but does not count against the TAC. The TAC is shared between subareas A and E. (Dash indicates no catch).

		Fleets Combined		First Nations	Total Landings (t)
		TAC (t)	Landings (t)	FSC (t)	
2013	A	35.0	1.3	-	1.3
	E		13.5	-	13.5
	B	75.0	82.6	4.9	87.5
	C	25.0	18.3	-	18.3
	D	35.0	38.8	-	38.8
	Total	170.0	154.4	4.9	159.3

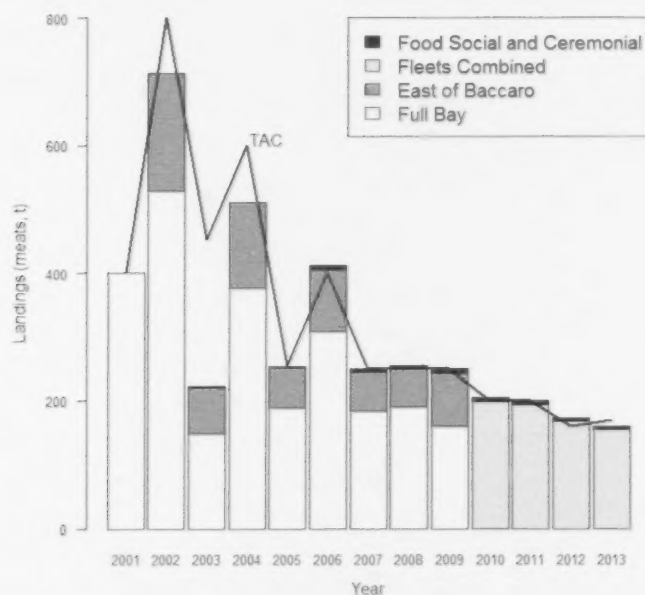


Figure 2. Annual scallop landings (meats, t) by fleet, which count against the TAC; landings for FSC purposes, which do not count against the TAC; and total TAC for SFA 29 West.

The scallop fishery in SFA 29 West occurred in all subareas (A–E, Appendix 1). All subareas opened for the 2013 fishing season on June 24th. Subareas D and B closed on July 11th and July 19th, respectively as the quota had been caught or exceeded in those two subareas. The

remaining areas were closed on August 31st. There were no closed areas in 2013 as a result of lobster bycatch.

## Survey

A post-season joint industry/departamental research survey has been conducted annually since 2001 when the current fishery started. The survey design was initially a simple random design over the whole area. From 2002 to 2004, a stratified random design was used with strata defined by the management subareas A to E. Starting in 2005, strata were defined by bottom type as identified by geologists as part of the joint industry/government multibeam mapping project conducted in this area. A new interpretation of the bottom types was made available in 2008 and was used to design the surveys for 2008 through 2013. The new assessment approach uses categories of scallop habitat suitability to define strata, with habitat suitability probabilities binned into 3 categories defined by Low [0, 0.3), Medium [0.3, 0.6), and High [0.6, 1.0). Survey estimates from 2001 to 2013 were modified to correspond to the new design. Subarea E has not been consistently covered in the survey due to time limitations; this subarea is considered to be marginal habitat for scallops and, as a result, has been less of a survey priority.

Time trends in abundance (number per tow) of commercial ( $\geq 100$  mm shell height), recruit size (90–99 mm), and pre-recruits (size 20–60 mm) scallops are plotted in Figures 3–5. In 2013, commercial densities were similar across habitat suitability categories within subareas. Declines were observed in the High suitability categories in subareas B–D, in the Medium categories in subareas B and D, and in the Low categories in subareas A and C (Figure 3). Commercial densities remained similar in all other habitat categories within subareas.

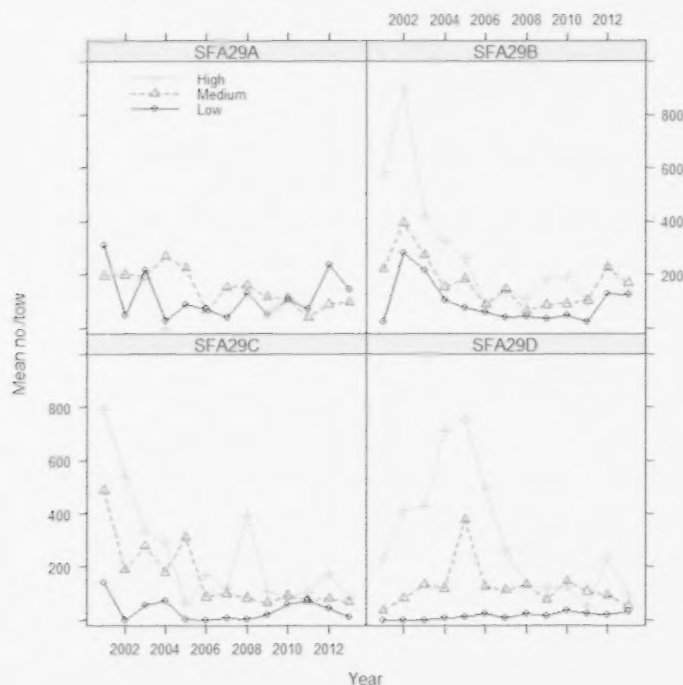


Figure 3. Survey mean number per tow for commercial size scallops ( $\geq 100$  mm) by subarea for SFA 29 West for Low, Medium and High categories of habitat suitability probabilities. Mean coefficients of variation (CVs) over the time series ranged from 0.24 to 0.75.

In 2013, the number of recruits decreased in both habitat categories in subarea A. In subarea B, recruit numbers decreased in the Medium and Low categories but did not change in the High category. In subarea C, recruit numbers decreased in the High category and are currently similar to levels observed in the Medium and Low categories, whereas recruit numbers in the Medium and Low categories did not change. In subarea D, recruit numbers are similar between the habitat categories and did not change (Figure 4).

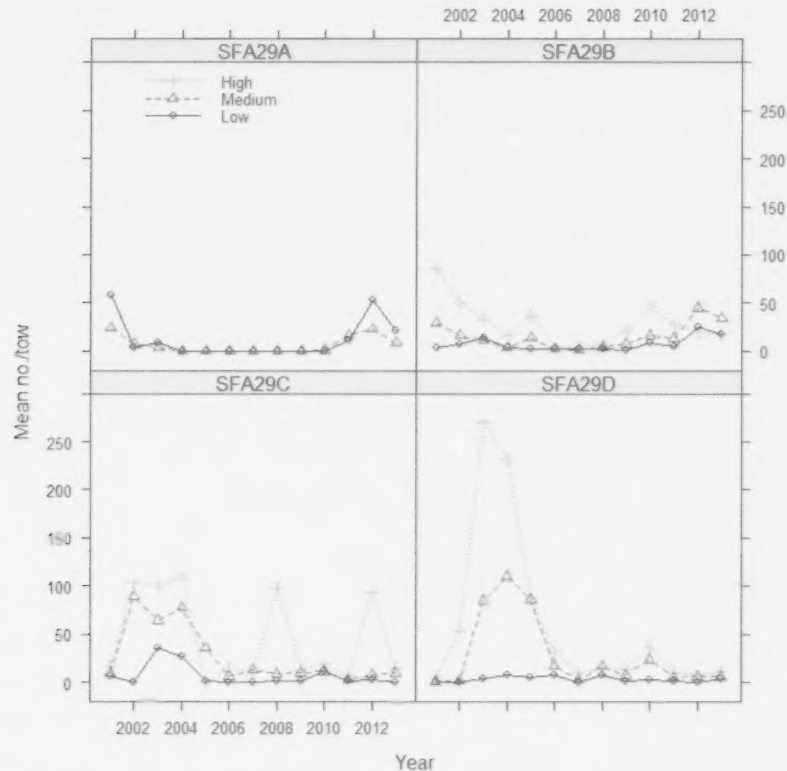


Figure 4. Survey mean number per tow for recruit size scallops (90–99 mm) by subarea for SFA 29 West for Low, Medium and High categories of habitat suitability probabilities. Mean CVs over the time series ranged from 0.43 to 0.94.

In 2013, an increase in pre-recruits (20–60 mm) was observed in subareas A–D. Within subareas C and D, the greatest numbers per tow were observed in the High habitat suitability category, followed by the Medium, then Low categories. These values are the highest observed in the time series (Figure 5). Based on growth estimates, these scallops are not expected to recruit to the fishery until 2016.



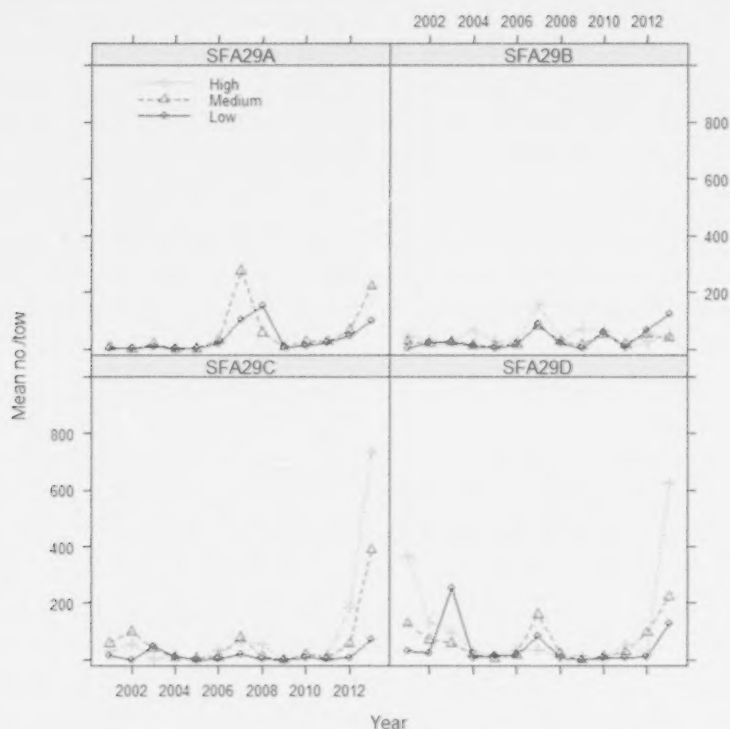


Figure 5. Survey mean number per tow for pre-recruit size scallops (20–60 mm) by subarea for SFA 29 West for Low, Medium and High categories of habitat suitability probabilities. Mean CVs over the time series ranged from 0.2 to 1.2.

## Assessment

A new framework assessment methodology was accepted in February 2014 that uses a habitat-based population model for subareas A–D. The state-space habitat-based population model was fit to the commercial catch, effort derived from the vessel monitoring system, and survey data.

The population biomass density was much higher in the High suitability category at the beginning of the fishery and has been reduced over time to be more similar to densities found in the Medium and Low suitability categories. Commercial densities are currently near the lowest of the time series. The population recruit number density estimates indicate that recruit densities are low across all subareas A–D and numbers are similar across habitat categories. These trends are consistent with what was observed in the survey. Exploitation trends by habitat suitability showed higher exploitation rates in the High suitability categories for subareas B–D and in the Medium category for subarea A.

Subarea E is not covered by the scallop habitat suitability map; therefore, the model cannot be used for this area. In 2013, fishing in subarea E occurred along the border with subarea B similar to previous years. Commercial catch rates were similar between the two fleets at approximately 25 kg/h. Five surveys tows were conducted in the fished areas of subarea E. Observed numbers per tow (146 and 11 for commercial and recruit sizes, respectively) were similar to observed abundances in subareas A–D (Figures 3, 4).

## Lobster

In 2013, there were 1,081 observed tows (199 EoB and 882 FB), 46 days observed (9 EoB and 37 FB) and 12 trips observed (2 EoB and 10 FB). It was estimated that 15,385 lobsters were caught during the SFA 29 West scallop fishery in 2013. This relates to a weight of approximately 8.9 t using the average observed carapace length (90 mm) and average weight of a lobster (0.58 kg) caught in SFA 29 West in 2012 and 2013. This number is almost three times the average estimate from 2012 but is similar to estimates for previous years. The estimated number of dead or injured lobsters was 2,286. This is considerably higher than 2012 but comparable with the average for previous years. The estimated number of lobster caught represents < 0.1% of the lobsters caught in the 2012/2013 Lobster Fishing Area (LFA) 34 lobster fishery and 0.2% of the lobsters caught in the area of LFA 34 corresponding to SFA 29 West. Trends in lobster catches by the lobster fishery in the SFA 29 West area as a whole are not indicative of an area that has been adversely affected by the scallop fishery since 2001.

## Sources of Uncertainty

Advice on expected impacts of the 2014 fishery was based on the assumptions that the same catch and fishing pattern with respect to habitat suitability areas will occur in 2014, and that current year estimates of natural mortality and growth rates will apply. Fishing patterns with respect to habitat suitability have been relatively consistent over the course of the fishery. Somatic growth rates are difficult to predict due to high annual variability. However, the projections from the assessment model are relatively robust to the assumptions concerning natural mortality and growth rate.

## CONCLUSIONS AND ADVICE

Assuming the same catch in 2014 as in 2013, and that the same fishing pattern with respect to habitat suitability areas occurs in 2014, current levels of exploitation will probably result in little change in biomass in 2014 (Table 2). However, biomass densities of commercial sized scallop in the High and Medium habitat categories are currently at or near their lowest values in the time series.

An increase in pre-recruits (20–60 mm) was observed throughout SFA 29 West; however, the highest values are mainly in subareas C and D where pre-recruit numbers are the highest observed in the time series. Based on growth estimates, these pre-recruits are not expected to recruit to the fishery until 2016.

Comparisons of exploitation and density estimated from the assessment model for the Medium and High suitability categories for each subarea reflect aspects of the behaviour of the population in response to removals. High exploitation rates at the beginning of the time series in the High suitability areas exceeded the population's ability to compensate for fishery removals via recruitment until densities had declined to around 2 to 2.3 t/km<sup>2</sup>. In subarea D, densities did not decline for the first two years (2004 and 2005) due to the recruitment of a large year-class and low exploitation in 2005; however, densities did decline after the 2006 fishery. These densities appear to represent an approximate equilibrium level with respect to the recent exploitation and recruitment rates. The declines for the Medium suitability areas were not as great (except for subarea C) and densities have ranged from 1.5 to 1.8 t/km<sup>2</sup> since 2006, at a level where on average recruitment appears to balance out removals.

In the absence of increases in the rate of recruitment, continued fishing at the recent levels in the Medium and High suitability areas will likely result in densities remaining in the ranges that they have been since 2006. The large number of pre-recruits observed in the survey could

result in increased densities of commercial size animals starting in 2016, especially in the High suitability areas.

*Table 2. Evaluation of the impact of setting the 2014 catch to be the same as that in 2013 for SFA 29 West. Estimates of exploitation, changes in biomass, and probability of decline in biomass assume that the fishing pattern in 2014 would be the same as in 2013.*

Subarea	Habitat Suitability	Catch (t)	Exploitation	% Change in Biomass	Probability of Decline
A	Low	0.19	< 0.01	16.9	0.39
	Medium	1.11	0.01	-5.4	0.50
B	Low	11.33	0.01	29.2	0.40
	Medium	55.48	0.07	23.2	0.22
	High	20.69	0.24	-0.6	0.51
C	Low	0.87	0.02	-19.5	0.54
	Medium	7.47	0.04	5.6	0.35
	High	9.95	0.13	2.1	0.49
D	Low	0.64	0.03	2.4	0.50
	Medium	21.47	0.09	-2.2	0.55
	High	16.70	0.08	0.8	0.50

## OTHER CONSIDERATIONS

Scallop removals accounted for in the assessment include landings from the inshore scallop fleets and FSC catch, when applicable. For non-scallop fisheries where bycatch information is available, scallop discards were insignificant compared to discards from the inshore scallop fleet (Gavaris et al. 2010). Information on discards of other species from the 2013 SFA 29 West scallop fishery were presented in Sameoto et al. (2014).

## SOURCES OF INFORMATION

This Science Advisory Report is from the March 13, 2014, Assessment of SFA 29 West of 65°30' Scallop. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

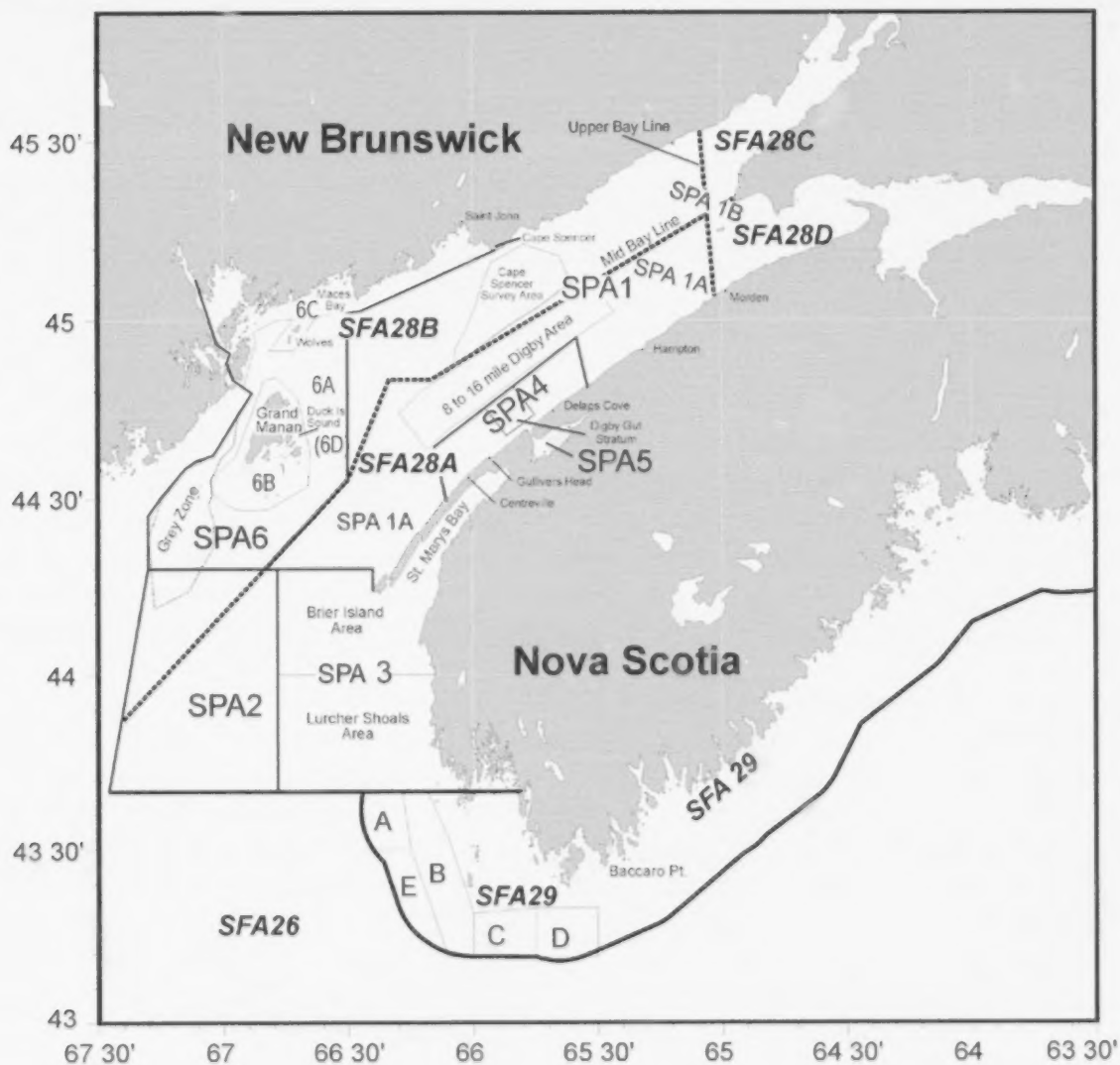
Gavaris, S., K. Clark, A. Hanke, C. Purchase, and J. Gale. 2010. Overview of Discards from Canadian Commercial Fisheries in NAFO Divisions 4V, 4W, 4X, 5Y and 5Z for 2002–2006. Can. Tech. Rep. Fish. Aquat. Sci., 2873: vi + 112 pp.

Sameoto, J.A., Smith, S.J., Glass, A., Hubley, B., and Denton, C. 2014. Scallop Fishing Area 29: Stock Status and Update for 2014. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/064. v + 67 p.



## APPENDIX

Appendix 1. Locations and place names for inshore Scallop Fishing Areas (SFAs) and Scallop Production Areas (SPAs).



**THIS REPORT IS AVAILABLE FROM THE:**

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